REMARKS

Claims 28-57 were pending and examined. By virtue of the instant Amendment and Response, claims 28, 34, 38, 48 and 52 are amended, claims 35, 49 and 53 are canceled and no claims are added. Claims 1-27 were previously canceled. Accordingly, claims 28-34, 36-48, 50-52 and 54-57 are currently pending. Applicants submit no new matter is added herein.

Claim Amendments

Without addressing the patentability of claim 28 as previously presented in view of the cited documents, and without addressing the relevancy (if any) of the documents, and merely to streamline prosecution of the present application, clarifying amendments have been made to claim 28. Support for the amendments can be found throughout the instant application and at least at claim 57. Claim amendments are also introduced to claims 34, 38, 48 and 52, which are discussed in more detail below.

Objections to the Drawings

The drawings were objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "73" (figure 8). Per the Examiner's suggestion, Applicants herein amend the specification at paragraph [0064] to read as follows:

> "According to another embodiment, the sleeve-like member 32 may include a slit 72. The slit 72 extends from the upper edge 33 and/or the lower edge 34 and is bendable along a folding line 73, see Fig. 8. The slit 72 permits bending outwardly of a part of a sheet band 60 of the tubular material for forming of a vane, see also WO02/03394, which discloses how such a vane may be provided"

Applicants submit this amendment is supported throughout the original application, and at least by Figure 8. In view of this amendment, Applicants submit the objection is overcome and respectfully request the examiner reconsider and withdraw the objection.

Objections to the Claims

Claims 34, 35, 38, 48, 49 and 51-53 were objected to because of the following:

Claim 34 recites the limitation "said weld joint" in line 1. The Examiner alleges there is insufficient antecedent basis for this limitation in the claim. Claim 34 is amended to recite:

> A spacer according to claim 32, wherein said sleeve-like members are permanently connected to each other by means of weld joints, wherein said weld joints include an edge weld at said connection area at at least one of the upper edge and the lower edge.

Applicants submit support for this claim is found throughout the instant application and specifically at least in original claim 33.

Claim 35 recites the limitation "said connection area" in line 2. The Examiner alleges there is insufficient antecedent basis for this limitation in the claim. Claim 35 is canceled herein, thereby rendering this objection moot.

Claim 38 recites the limitations "the first connection portion" in line 1 and "the second connection portion" in line 2. The Examiner alleges there is insufficient antecedent basis for this limitation in the claim. Claim 38 is amended to depend from claim 37, which recites "a first connection" and a "second connection".

Claim 48 recites the limitation "said vane" in line 1. The Examiner alleges there is insufficient antecedent basis for this limitation in the claim. Claim 48 is amended to recite:

> A spacer according to claim 37, wherein the spacer includes at least one vane for influencing the coolant flow, said vane being formed by a portion of the material, which extends from the first connection portion.

Applicants submit support for this claim is found throughout the instant application and specifically at least at claim 47.

Claim 49 recites the limitation "the first connection portion" in line 2. The Examiner alleges there is insufficient antecedent basis for this limitation in the claim. Claim 49 is canceled herein, thereby rendering this objection moot.

Claim 51 recites the limitation "said vane" in line 1. The Examiner alleges there is insufficient antecedent basis for this limitation in the claim. Claim 51 depends from claim 48, which has been amended to recite "at least one vane". In view of the amendments made to claim 48, from which claim 51 depends, Applicants submit the objection to claim 51 is rendered moot.

Claim 52 recites the limitation "said vane" in line 1. The Examiner alleges there is insufficient antecedent basis for this limitation in the claim. Claim 52 is amended to recite:

> A spacer according to claim 47, wherein the sleeve-like member seen in the direction of the longitudinal axis has four substantially orthogonal long sides, wherein said vane extends outwardly from one of said long sides.

Applicants submit support for amended claim 52 is found throughout the specification, and at least at claim 43.

Claim 53 recites the limitation "said long sides" in line 2. The Examiner alleges there is insufficient antecedent basis for this limitation in the claim. Claim 53 is canceled herein, thereby rendering the objection moot.

In view of the above amendments and remarks, Applicants submit the objections to claims 34, 35, 38, 48, 49 and 51-53 are either overcome or rendered moot. Accordingly, Applicants respectfully request the Examiner reconsider these objections and withdraw the same.

Rejections Under 35 USC §103

Claims 28-36, 40-43, 47, 54 and 57 were rejected under 35 USC §103(a) as allegedly being unpatentable over U.S. Patent No. 5,875,223 to Nylund in view of U.S. Patent No. 5,331,679 to Hirukawa. Applicants respectfully disagree with the Examiner and traverse this rejection.

Nylund discloses, *inter alia*, a design of a spacer for retaining elongated elements in a fuel assembly for a light-water nuclear reactor. More particularly, the invention disclosed in Nylund relates to the design of a spacer sleeve for such a spacer. *See* col. 1, lines 6-9.

Hirukawa discloses a fuel spacer for a fuel assembly having "a plurality of tubular ferrules . . . [t]he adjoining ferrules are joined together horizontally, each of the ferrules has at least one end to which a plurality of cutout portions are formed circumferentially of the end portion and at least one flat portion is formed between adjoining petal portions at which the adjoining ferrules are spot welded. Each of the cutout portions and petal portions of the tubular ferrule has various shapes such as trapezoidal, rectangular, triangular, V or M shape. The cutout portions and petal portions may be formed at both axial ends of the tubular ferrule. The adjoining ferrules are joined together such that an end portion of one ferrule to

which the cutout portions are formed is spot welded to an end portion of another ferrule to which any cutout portion is not formed." *See* Abstract.

On pg. 5 of the Office Action, the Examiner states that Nylund "fails to teach that the upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces." However, the Examiner states that the lack of disclosure in Nylund is remedied by Hirukawa since, according to the Examiner, "Hirukawa teaches a sleeve-like member 12d wherein the upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks 21b, which are aligned with a respective one of said abutment surfaces 13a, and with wave valleys 22 located between two adjacent ones of said abutment surfaces 13a (figure 13)." The Examiner appears to conclude that Hirukawa at col. 9, lines 46-51 provides motivation to combine the two cited references and therefore, it would have been obvious to one of ordinary skill in the art to construct the sleeve-like member to have a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces at the upper edge of said sleeve-like member. Applicants respectfully disagree.

The spacer, as recited in claims 28 and 57, and the claims dependent therefrom, includes, *inter alia*, a spacer enclosing a number of cells, each cell being formed by a sleeve-like member having a lower edge and an upper edge, the lower edge seen transversely to the longitudinal axis, having a wave-like shape with wave peaks, which are aligned with a respective one of the abutment surfaces, and wave valleys located between two adjacent ones of said abutment surfaces and an upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces.

As described and illustrated in the instant specification, the spacer encloses a number of cells, each of which is formed by a sleeve-like member having a lower edge and an upper edge and also includes four elongated abutment surfaces which are adapted to abut a fuel rod. The abutment surfaces may be designed in various ways, for instance as substantially plane surfaces or curved surfaces, e.g., ridges. In the embodiments disclosed in the specification, the abutment surfaces are formed by four such elongated ridges projecting inwardly, and each of the ridges extends substantially in parallel with a longitudinal axis along substantially the

whole length of the sleeve-like member from the upper edge to the lower edge. *See* specification at pp.10-11 and FIGS. 6 and 9.

This is entirely contrary to Nylund, which illustrates a sleeve having one flat, or straight, edge and one wavy edge. *See*, e.g., FIG. 5 and col. 3, lines 29-32, *See also* instant specification at para. [0009]. Nylund is interested in achieving reduced risk of wear on the fuel rods by foreign matter. *See* col. 1, lines 62-63. In contrast, the instant application discusses uniform abutment, i.e., pressure, against the fuel rod, which is achieved by, *inter alia*, the design of the sleeve-like member. *See* instant application at para. [0020].

The disclosure in Nylund is similar to FIGS. 4 and 11 of Hirukawa, which illustrate a ferrule/spacer having a flat, or straight, edge and an opposing edge with petal portions 21. *See* Hirukawa at col. 4, lines 29-30 and col. 8, lines 4-6 and 28-35.

Hirukawa also illustrates a spacer having and edge with triangular cutout portions 26 and an opposing edge having petal portions 21. *See* FIG. 11, col. 2, line 55 to col. 3, line 36 and col. 8, lines 6. As stated in the instant application, Hirukawa appears to disclose "wave peaks" of the upper edge are aligned with "wave valleys" of the lower edge. *See* instant application at para. [0012]. Hirukawa is interested in achieving a reduced pressure loss of a fuel spacer. *See* col. 1 line 68 to col. 2 line 2. In contrast, the instant application discusses uniform abutment, i.e., pressure, against the fuel rod, which is achieved by, *inter alia*, the design of the sleeve-like member. *See* instant application at para. [0020]. Moreover, Hirukawa does not disclose or suggest abutment surfaces, rather it discloses projections 13a and 13b, which are formed by inwardly projecting portions of the tubular wall of the ferrule. *See* col. 4, lines 24-26.

Applicants respectfully point out that none of the sleeves disclosed in either reference include both the lower edge and the upper edge of the sleeves having wave peaks that are aligned with a respective one of the abutment surfaces and wave valleys located between two adjacent abutment surfaces, i.e., neither reference discloses a spacer where the wave peak on the top edge is aligned with the wave peak on the lower edge.

Despite the disclosures of various cut-outs and shapes on the opposing edges of the sleeves disclosed in Nylund and Hirukawa, Applicants respectfully submit that neither reference, either taken separately or in any combination, teach or suggest the instantly claimed spacers which includes, *inter alia,* a sleeve-like member having a lower edge seen transversely to the longitudinal axis, having a wave-like shape with wave peaks, which are

aligned with a respective one of the abutment surfaces, and wave valleys located between two adjacent ones of said abutment surfaces and an upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces.

Moreover, there is nothing in either reference that would motivate one of ordinary skill in the art to combine the two references, especially since both Nylund and Hirukawa disclose sleeves having opposing edges, where one edge is flat and the opposing edge has a cut-out or shape. Additionally, each reference seeks to achieve solutions to different problems.

Nevertheless, even if one were to combine the two references, one of ordinary skill in the art would not be motivated to make the sleeve-like member recited in the instant claims since the combination of the references does not disclose or suggest a spacer that includes, *inter alia*, a spacer enclosing a number of cells, each cell being formed by a sleeve-like member having a lower edge and an upper edge, the lower edge seen transversely to the longitudinal axis, having a wave-like shape with wave peaks, which are aligned with a respective one of the abutment surfaces, and wave valleys located between two adjacent ones of said abutment surfaces and an upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces.

Accordingly, Applicants submit the instant rejection as applied to independent claims 28 and 57, and the claims dependent therefrom, is overcome and respectfully request the Examiner reconsider and withdraw the instant rejection.

Claims 37-39 were rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund and Hirukawa as applied to claim 1, and further in view of U.S. Patent No. 6,901,128 to Mori et al. Applicants submit a typographical error appears in the office action with regard to application of Nylund and Hirukawa. Specifically, Nylund and Hirakawa were applied to independent claim 28, not claim 1. Applicants respectfully disagree and traverse this rejection.

Nylund and Hirukawa are discussed above. Mori et al. relates to a fuel assembly in a pressurized water reactor, and in particular, to a foreign matter filter serving as a protection

means against foreign matter for preventing intrusion of foreign matter into a fuel effective portion in a coolant. *See* col. 1, lines 9-13.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 37-39 indirectly depend from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Mori et al. does not change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Claims 48 and 51 were rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund, Hirukawa and Mori as applied to claim 37, and further in view of U.S. Patent No. 5,272,741 to Masuhara et al. Applicants respectfully disagree and traverse the instant rejection.

Nylund, Hirukawa and Mori et al. are discussed in detail above. Masuhara et al. relates to a nuclear fuel assembly and more particularly to a nuclear fuel assembly for a boiling water reactor having space structure improved on heat transfer from fuel rods to the coolant. *See* col. 1, lines 6-9.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 48 and 51 indirectly depend from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Neither Mori et al. nor Masuhara et al., change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Claims 44 and 45 are rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund and Hirukawa and further in view of U.S. Patent No. 4,800,061 to Shallenberger et al.. Applicants respectfully disagree and traverse the instant rejection. While paragraph 70 of the office action does not include claim 46 in the above-noted rejection, Applicants note paragraphs77-79 appear to address the rejection of claim 46. Accordingly, it appears that Claim 46 is also rejected over Nylund and Hirukawa in further view of Shallenberger et al. Applicants respectfully disagree and traverse this rejection.

Nylund and Hirukawa are discussed in detail above. Shallenberger et al. discloses an apparatus and method for facilitating a scratchless insertion of a fuel rod into cellular grids of a nuclear fuel assembly. *See* Abstract.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 44 -46 depend directly from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Shallenberger et al. does not change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Claims 49, 50, 52 and 53 were rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund and Hirukawa and further in view of Masuhara et al. Applicants respectfully disagree and traverse this rejection.

Nylund, Hirukawa and Masuhara et al. are discussed above.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 49, 50, 52 and 53 indirectly depend from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Masuhara et al. does not change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Claims 55 and 56 were rejected under 35 USC §103(a) as allegedly being unpatentable over Nylund and Hirukawa and further in view of U.S. Patent No. 5,778,035 to Nylund (referred to hereinafter as "Nylund 2").

Nylund and Hirukawa are discussed above. Nylund 2 relates to a method for equalizing the cooling between less loaded and more loaded sub-regions of a fuel assembly or between fuel assemblies in a light-water nuclear reactor. The equalization of the cooling is achieved by mixing a coolant flow within a mixing cross section comprising four orthogonally arranged sub-regions which may have considerably different power levels because of different degrees of burnup or the effect from the surroundings. *See* col. 1, lines 5-13.

Applicants respectfully disagree with this rejection, but do not believe it is necessary to address this rejection in detail since claims 55 and 56 indirectly depend from claim 28 and, as explained in detail above, neither Nylund nor Hirukawa, taken separately or in any combination, teach or suggest the spacer recited in claim 28. Nylund 2 does not change the analysis with respect to claim 28 or any of the claims dependent therefrom. Accordingly, Applicants submit this rejection is overcome and respectfully request the Examiner withdraw the rejection.

Applicants believe the foregoing amendments and remarks are fully responsive to the Office Action and that the claims as now presented herein are allowable. An early action to that effect is earnestly solicited. If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is invited to telephone the undersigned.

Applicants believe that no fees are due with the submission of this Amendment and Response. However, if any charges are incurred with respect to this Amendment, they may be charged to Deposit Account No. 503342 maintained by Applicants' attorneys.

Respectfully submitted,

By /Richard R. Michaud/
Richard R. Michaud
Registration No. 40,088
Attorney for Applicants

Michaud-Duffy Group LLP
CenterPoint
306 Industrial Park Road
Suite 206
Middletown, CT 06457-1532
Tel: (860) 632-7200
Fax: (860) 632-8269